Solar Terrestrial Relations Observatory (STEREO)

DSN Loading Study

William Hincy

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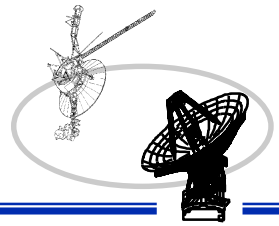
NASA Jet Propulsion Laboratory

STEREO DSN Support Assessment



Introduction

The Resource Allocation Planning and Scheduling Office (RAPSO) has reviewed the STEREO Deep Space Network (DSN) requirements. These requirements are from the STEREO Project Service Level Agreement (PSLA) and the updated STEREO User Loading Profile (ULP).

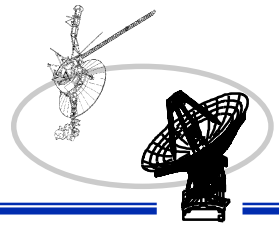
RAPSO has performed an analysis to determine the expected supportable time for STEREO from 2004 through 2007 and identified the periods of contention with other users of the DSN.

Loading Study Criteria

This study was conducted based upon STEREO's draft ULP, which was emailed on March 15, 2001, requesting 34 meter Beam Wave Guide (BWG), and 34 meter High Efficiency (HEF) subnets in 2004 through 2007.

It is important to note that there are a number of Mars 2007 missions that are not currently in the FASTER database.

STEREO DSN Support Assessment



Summary of Study Results

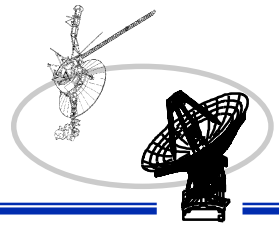
Preliminary DSN loading study results from 2004 through 2007 show the following:

1) In general, STEREO (STA), which is ahead of Earth, is forecasted to receive greater than 95% of their support in 2004. The total support requested from late November to January 2, 2005 is 540 hours including pre-and post-calibration times. Likewise, STEREO (STB), which is behind the Earth, is forecasted to receive greater than 96% of their support in 2004. The total support requested from late November to December 31 is 408 hours including pre-and post-calibration times.

2) In 2005, STA is forecasted to receive greater than 95% of their support. The total support requested is 2,161 hours including pre-and post-calibration times. Likewise, STB is forecasted to receive greater than 93% of their support in 2005. The total support requested is 1,825 hours including pre-and post-calibration times.

3) In 2006, STA is forecasted to receive greater than 95% of their support. The total support requested is 1,729 hours including pre-and post-calibration times. Likewise, STB is forecasted to receive greater than 92% of their support in 2006. The total support requested is 3,172 hours including pre-and post-calibration times.

STEREO DSN Support Assessment

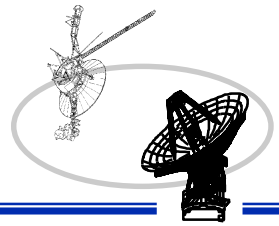


Summary of Study Results

4) In 2007, STA is forecasted to receive greater than 90% of their support. The total support requested is 299 hours including pre-and post-calibration times. Likewise, STB is forecasted to receive greater than 93% of their support in 2007. The total support requested is 297 hours including pre-and post-calibration times.

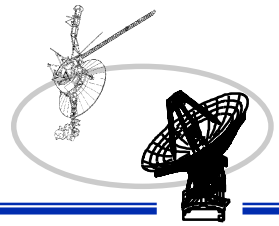
The total support requested for STA from 2004 through 2007 is 4,729 hours. Likewise, the total support requested for STB from 2004 through 2007 is 5,702 hours.

STEREO Mission Support



- **Mission Parameters For Both Spacecraft**
  - **Mission Objectives:**
    - Track Mass Ejections in 3D from Sun to Earth
    - Map the Corona and Heliosphere in 3D
    - Provide up to three day warning of space disturbances
  - **Projected Launch:**
    - November 26, 2004
  - **Trajectory:**
    - Heliocentric
  - **Mission Duration:**
    - Prime: November 26, 2004 through February 04, 2007
    - Extended: February 05, 2007 through February 04, 2010
  - **Projected Program Duration:**
    - November 26, 2004 through February 04, 2010

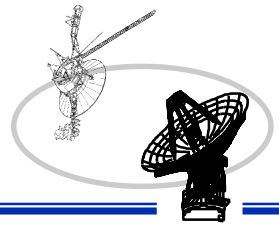
STEREO Mission Support



- **Project Tracking Requirements**
  - DSN requested to provide STA and STB spacecraft X-band Uplink and Downlink services from 34 meter subnets. In addition, the 70 meter subnet is requested during an emergency situation.
  - Current trajectory ephemeris file date: December 06, 2000
  - Forecasted viewperiods: November 26, 2004 - January 01, 2011

- **Preliminary DSN Loading Study Support Documents**
  - PSLA for fiscal year(s) 2001 - 2006 (November 1, 2000)

STA 2004 DSN Support Profile



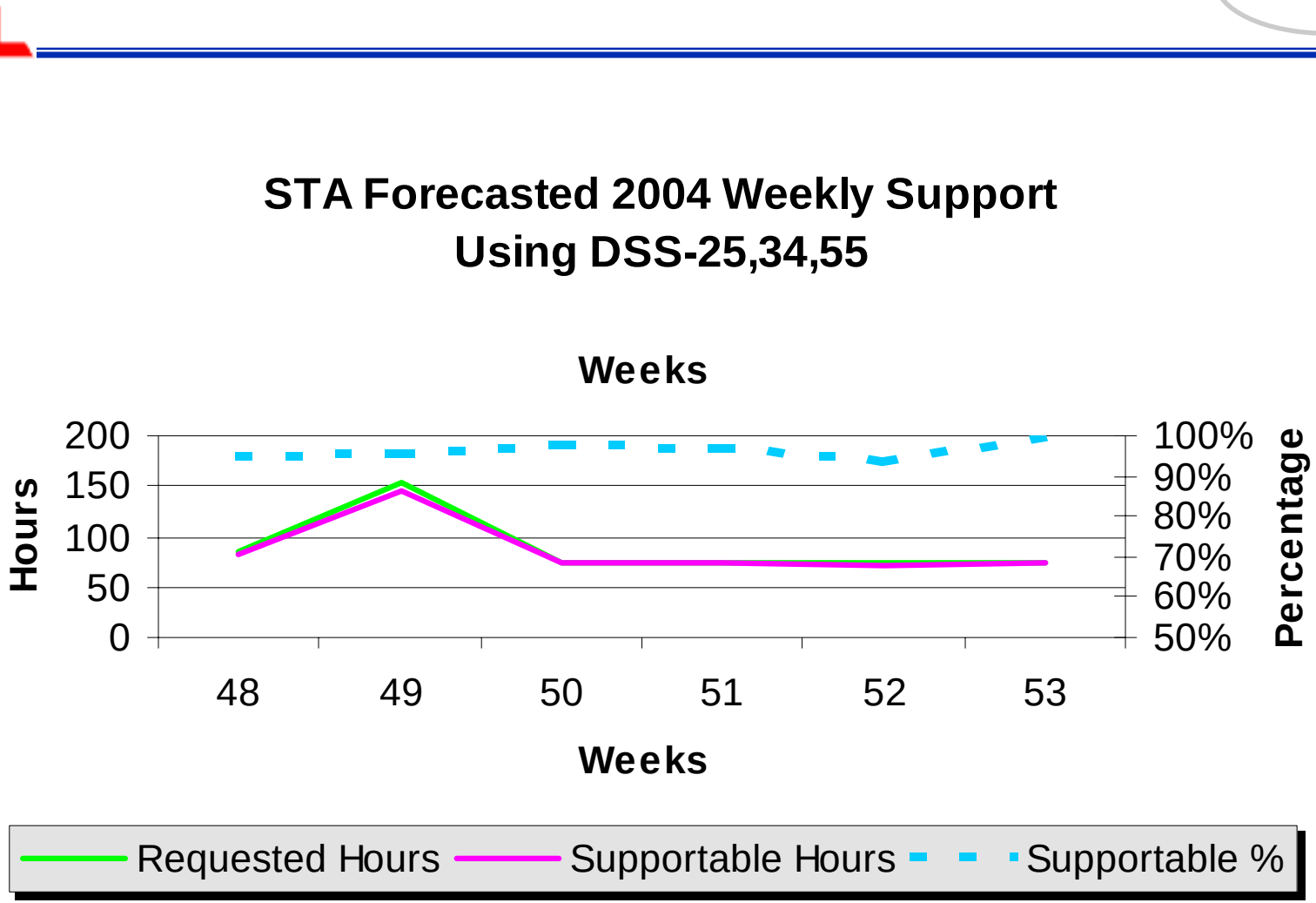
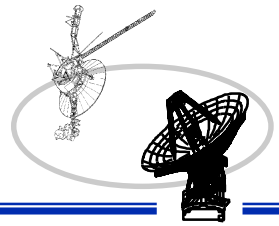


Figure 1

STB 2004 DSN Support Profile



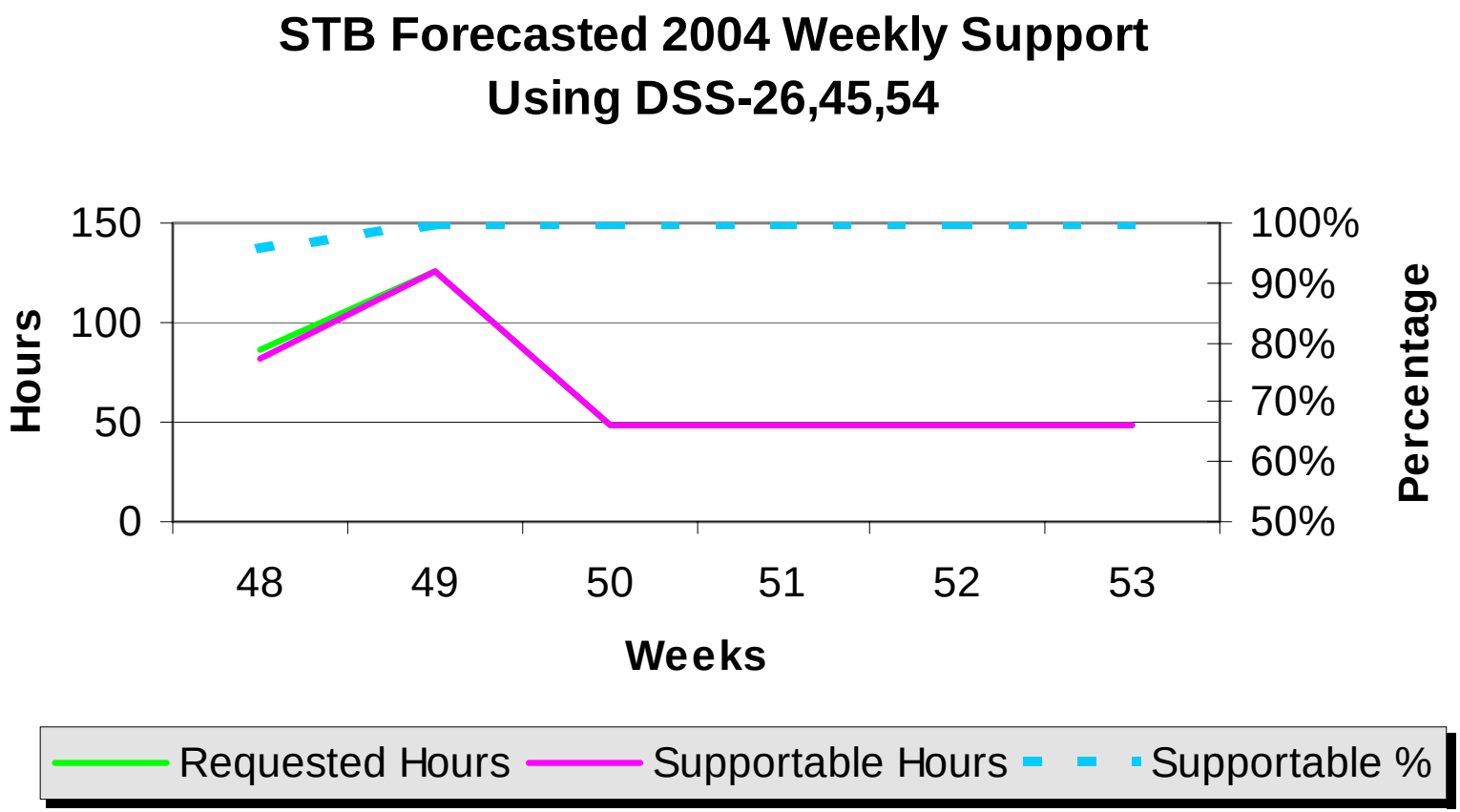


Figure 2

General DSN Support

In general, STA and STB are forecasted to receive greater than 95% and 96% of their requested support in 2004. Figures 1 and 2 shows STA and STB's requested hours (green dash line), forecasted supportable hours (solid purple line) and supportable percentage (dashed blue line).

STA 2005 DSN Support Profile

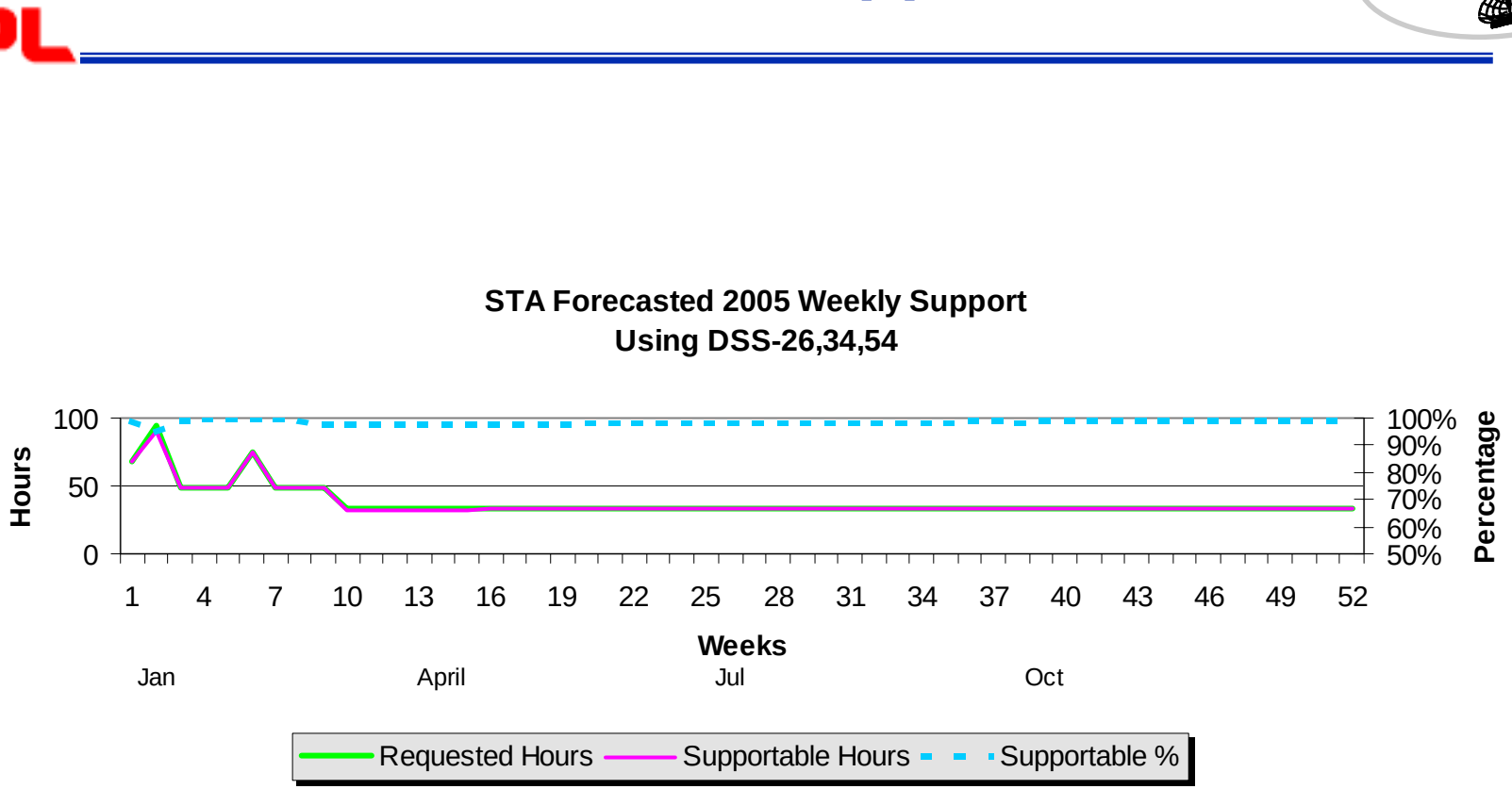


Figure 3

STB 2005 DSN Support Profile

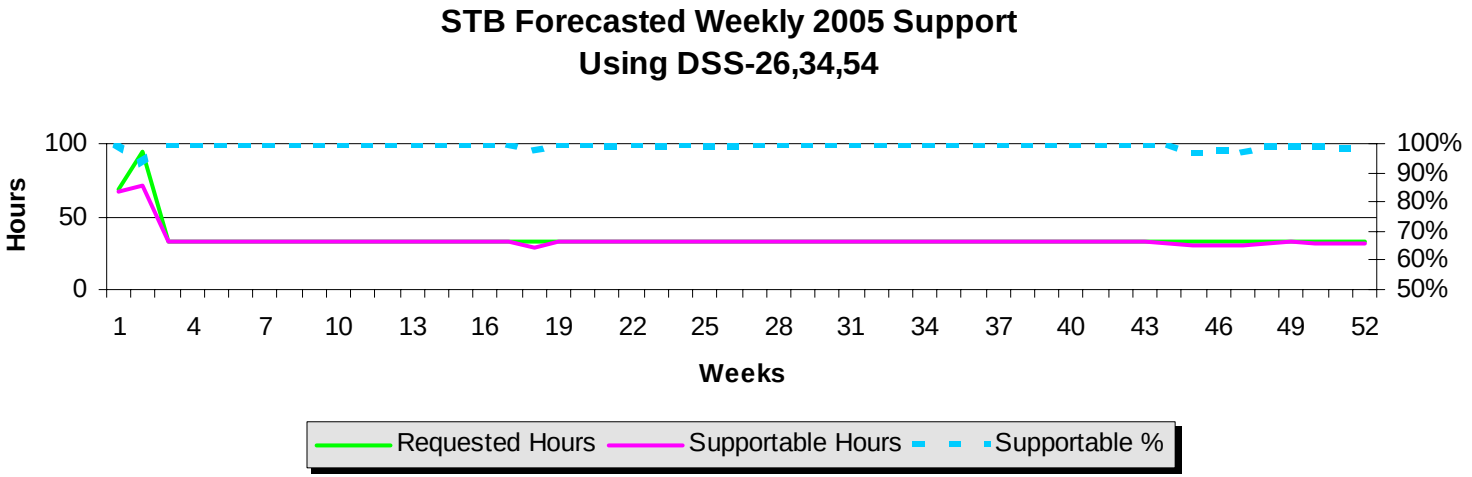
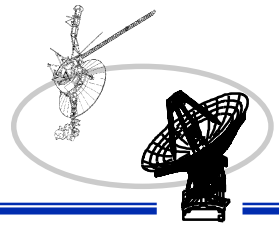


Figure 4



General DSN Support

In general, STA and STB are forecasted to receive greater than 95% and 93% of their requested support in 2005. Figures 3 and 4 shows STA and STB's requested hours (green dash line), forecasted supportable hours (solid purple line) and supportable percentage (dashed blue line).

STA & STB Maneuver

During week 02, STA is requesting six 8-hour passes on DSS-26,34,55. This request is to support the STA maneuver. STA is forecasted to receive 95% of their requested support during this week. Likewise, STB is requesting six 8-hour passes on DSS-26,34,54. STB, which is also conducting a maneuver, is forecasted to receive 93% of their support during this week.

STA 2006 DSN Support Profile

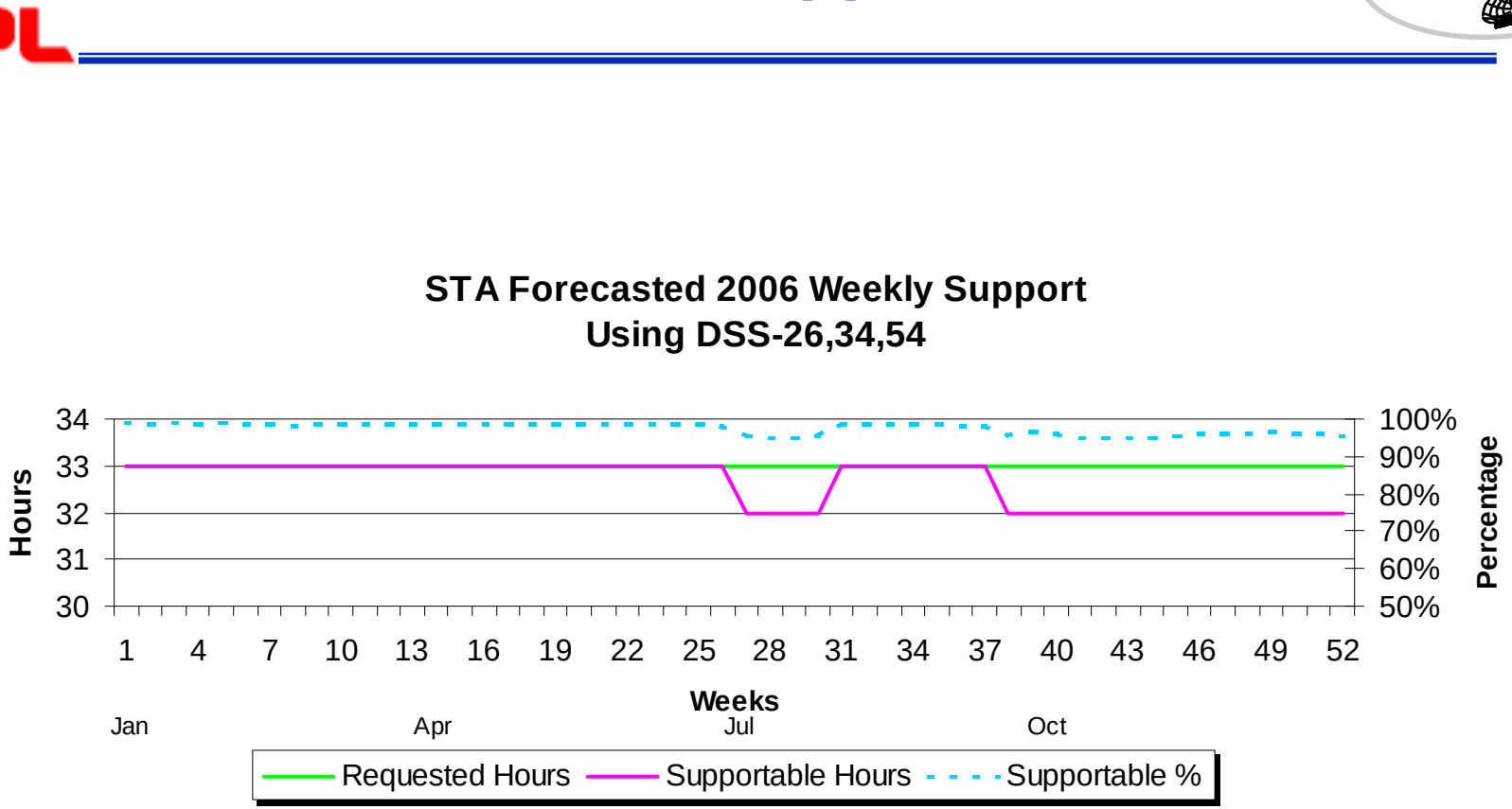


Figure 5

STB 2006 DSN Support Profile

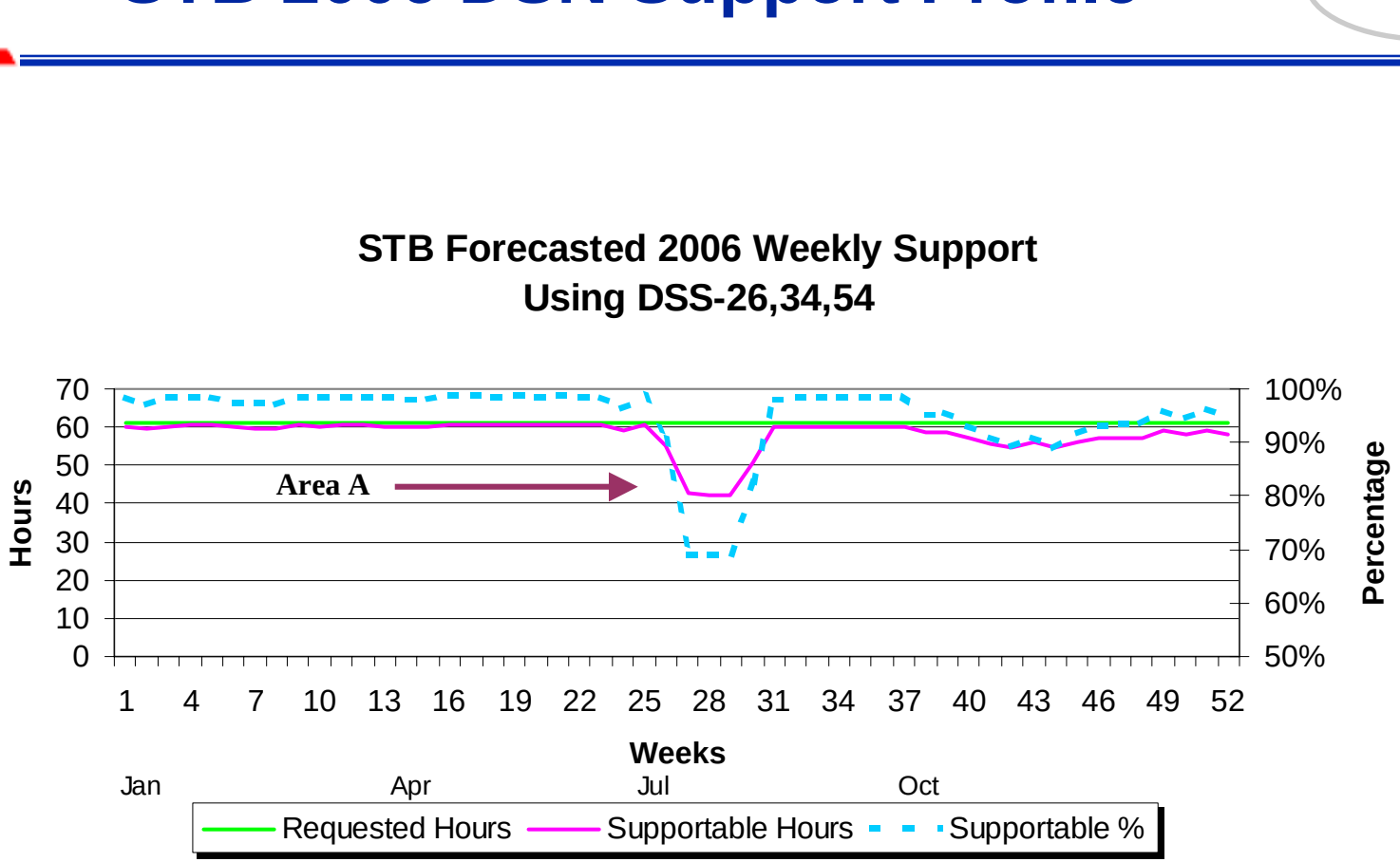


Figure 6

STB 2006 DSN Support Profile

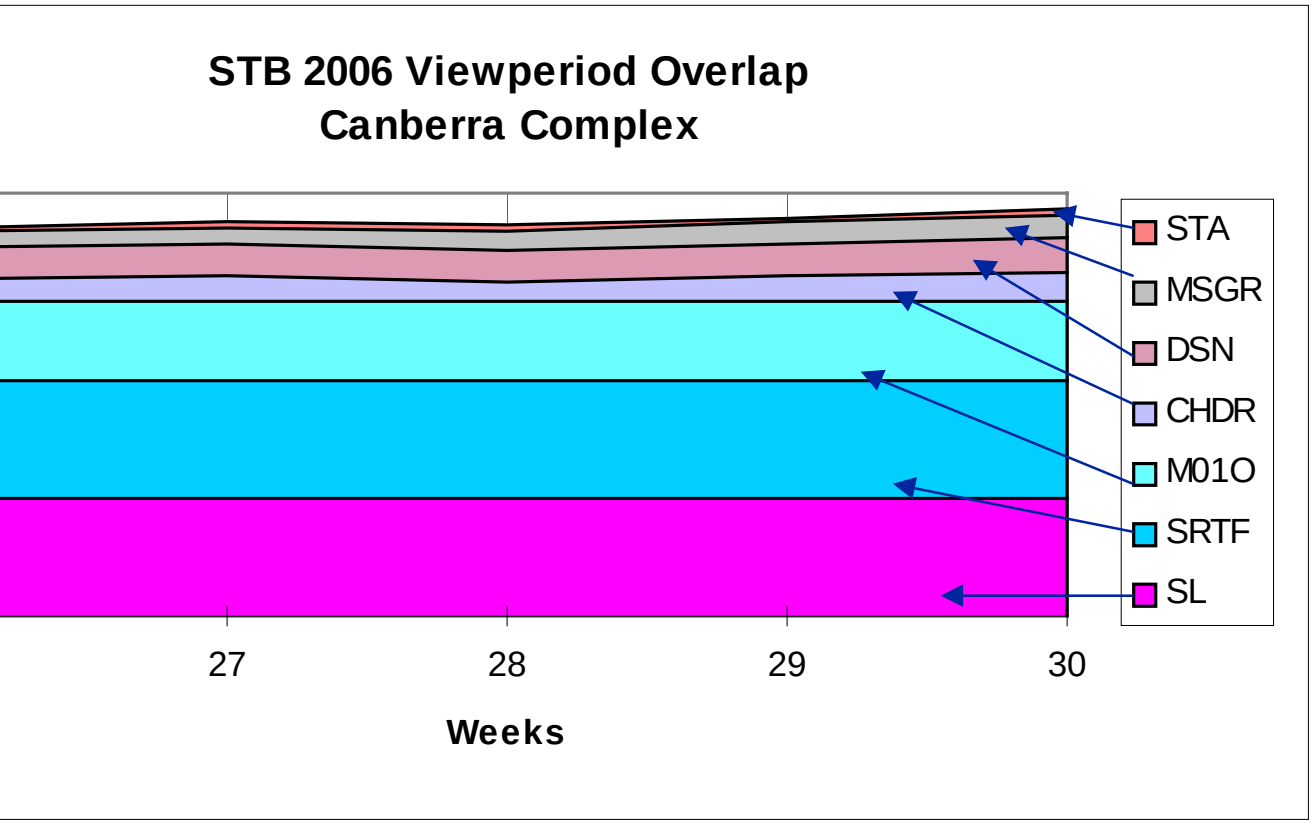
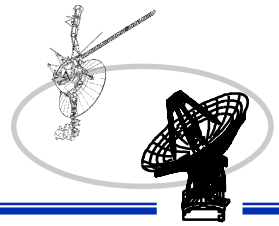


Figure 7

STEREO 2006 DSN Support Analysis



General DSN Support

In general, STA and STB are forecasted to receive greater than 95% and 92% of their requested support in 2006. Figures 5 and 6 shows STA and STB's requested hours (green dash line), forecasted supportable hours (solid purple line) and supportable percentage (dashed blue line).

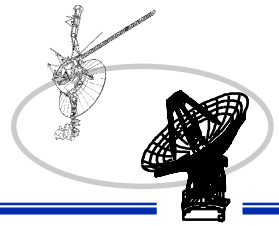
STB Routine Support

During weeks 26 through 30, STB is requesting seven 8-hour passes on DSS-26,34,54. STB is forecasted to receive 90%, 69%, 69%, 69% and 82% of their requested support during these weeks. Reference area A in Figure 6. Other projects who are using DSS-26,34,54 antennas and are in STB's viewperiod are: Chandra (CHDR), DSS Maintenance (DSN), Starlight (SL), Mars 01 Odyssey (M01O), Messenger (MSGR), Space Infrared Telescope Facility (SRTF) and STA. For example, figure 7 shows that both SL and SRTF have greater than 97% overlap with STB at the Canberra Complex.

Impact to Other Projects

SL is planned to launch on July 01, 2006 and they are requesting three, twenty-one, twenty-one, twenty-one and seventeen 8-hour passes per on DSS-25,34,54 in weeks 27 through 30. Negotiation with these projects to secure additional support is required.

STA 2007 DSN Support Profile



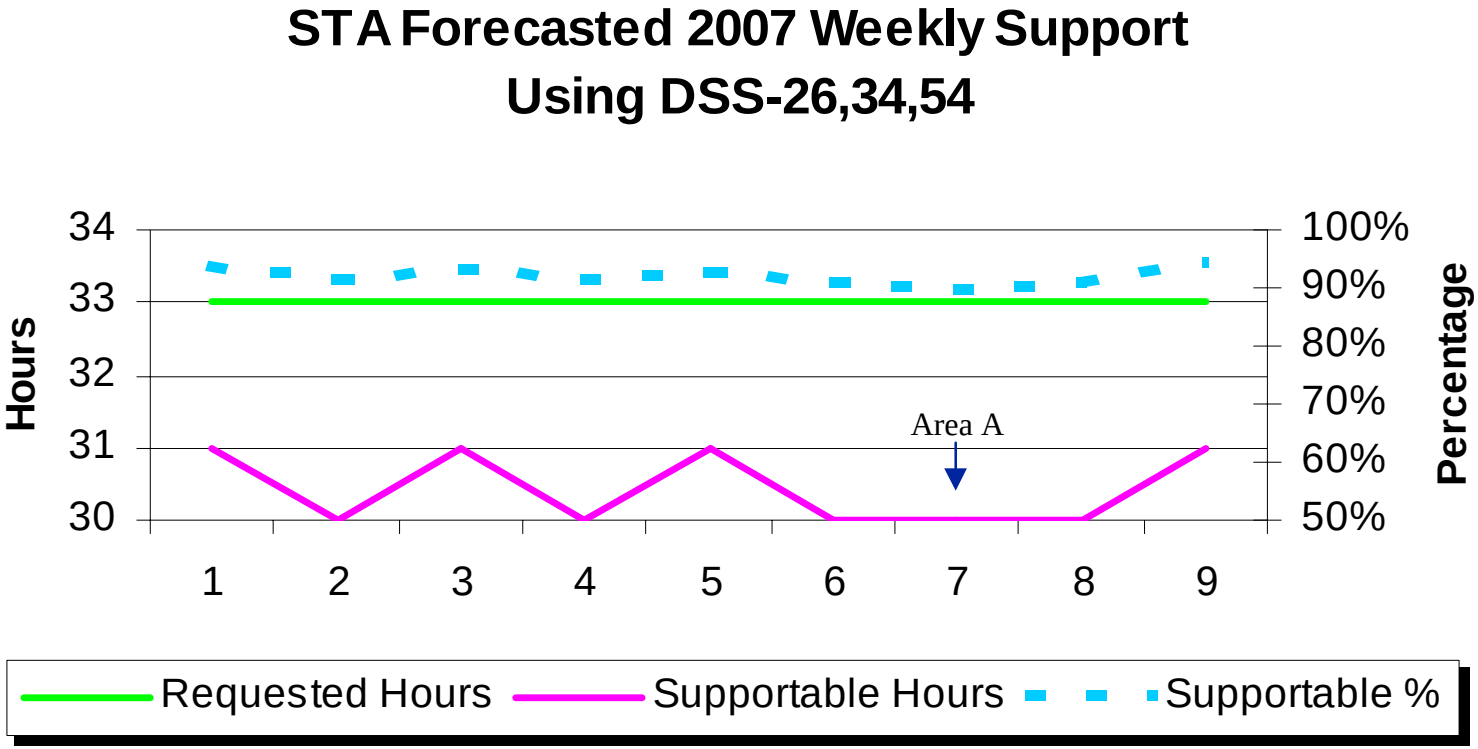
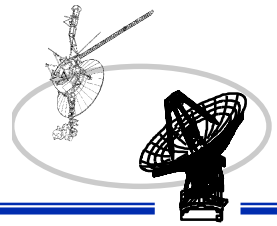


Figure 8

STB 2007 DSN Support Profile



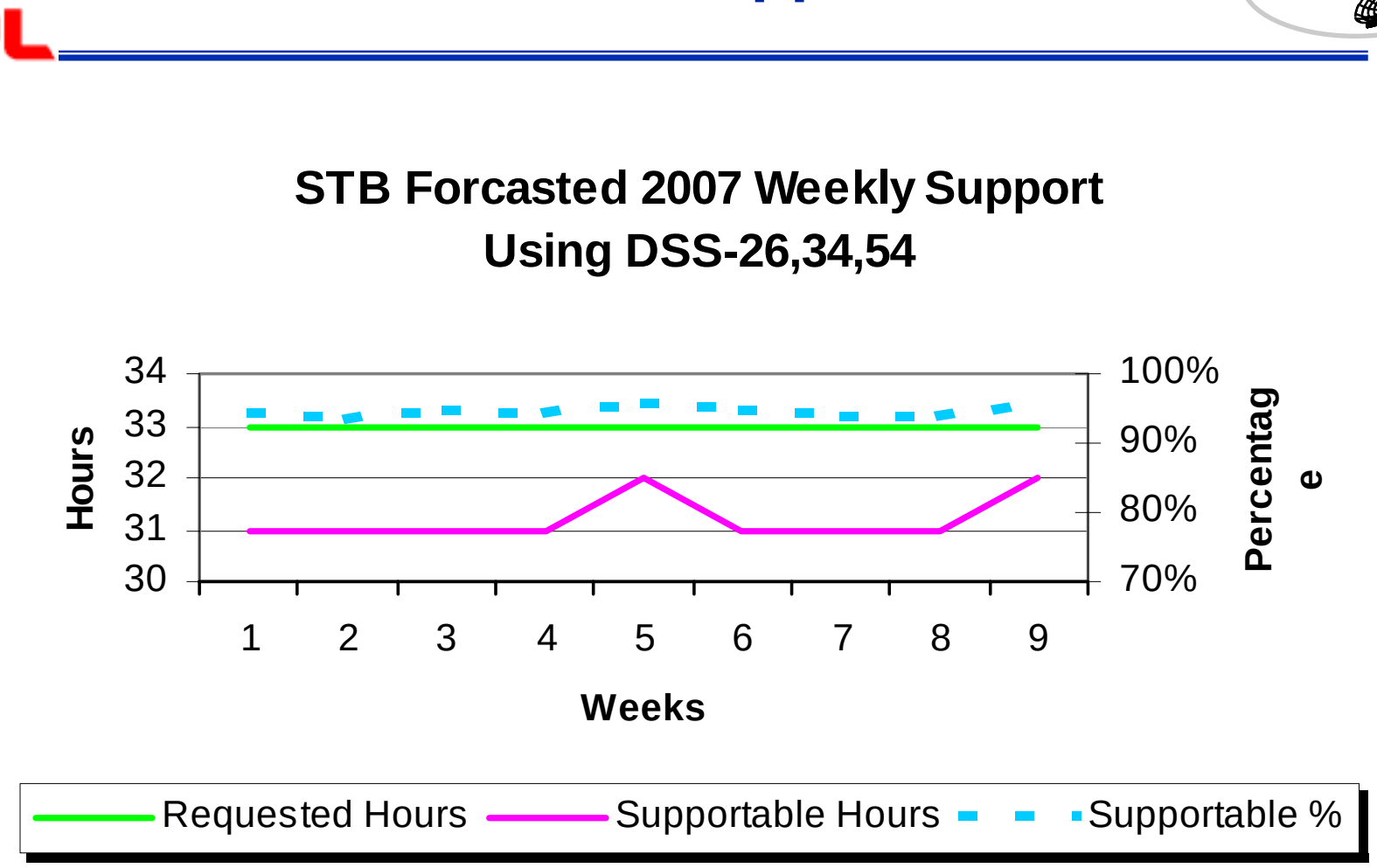


Figure 9

STB 2007 DSN Support Profile

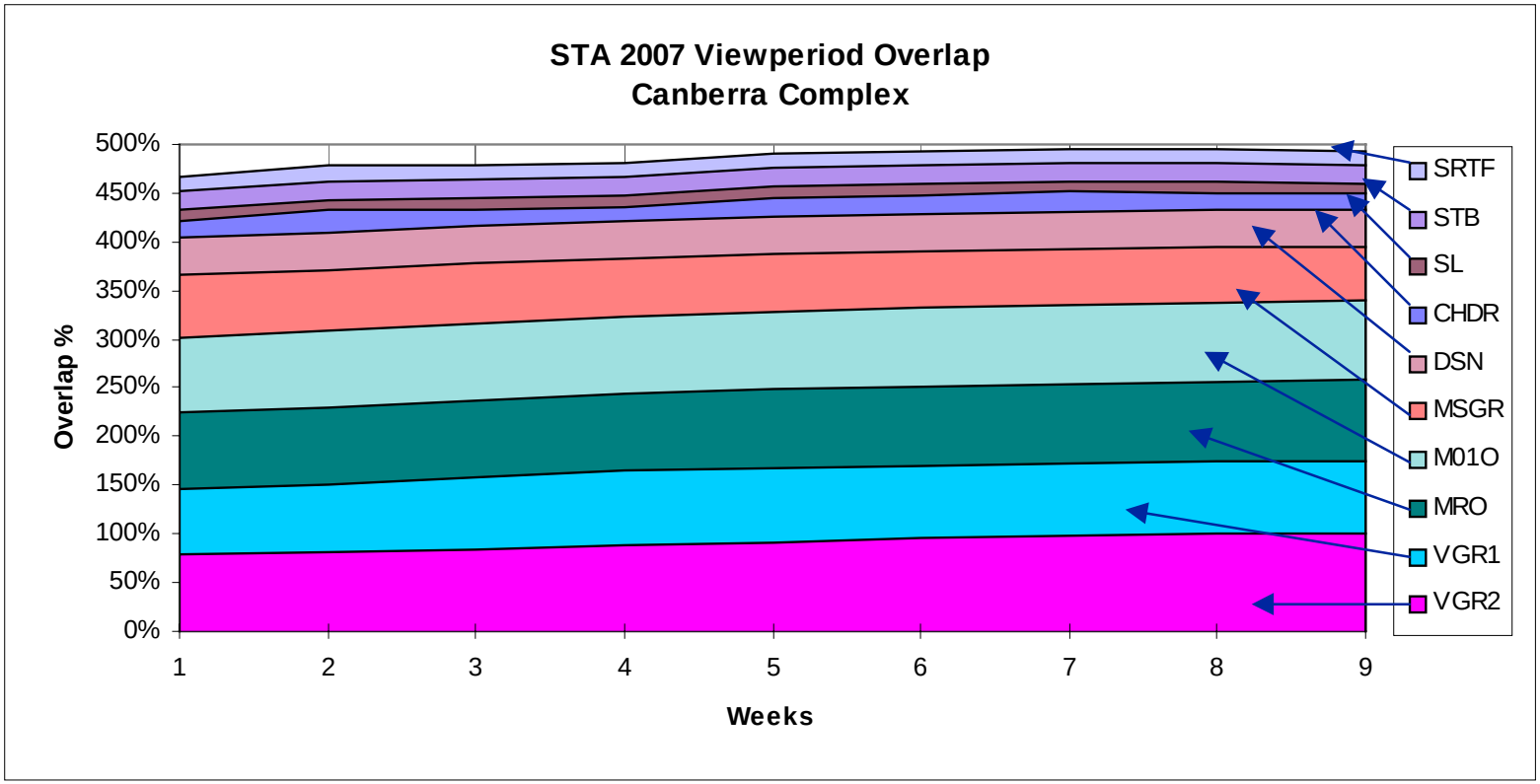
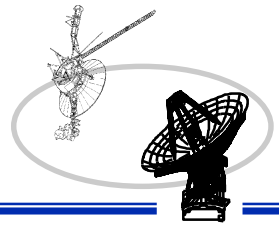


Figure 10



General DSN Support

In general, STA and STB are forecasted to receive greater than 90% and 93% of their requested support in 2007. Figures 8 and 9 shows STA and STB's requested hours (green dash line), forecasted supportable hours (solid purple line) and supportable percentage (dashed blue line).

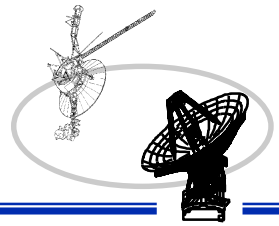
STA Routine Support

During weeks 06 through 08, STA is requesting seven 4-hour passes on DSS-26,34,54. STA is forecasted to receive 91%, 90%, 91% of their requested support during these weeks. Reference area A in Figure 8. Other projects who are using DSS-26,34,54 antennas and are in STA's viewperiod are: CHDR, DSN, M01O, Mars Reconnaissance orbiter (MRO), MSGR, SL, SRTF and STB, Voyager 1 (VGR1) and Voyager 2 (VGR2). For example, figure 9 shows that M01O, MRO, VGR1, and VGR2 have greater than 75% overlap with STA at the Canberra Complex.

Impact to Other Projects

CHDR is in routine operations and requesting twenty-one 1-hour passes on 34B1. DSN is performing routine maintenance and requesting one 6-hour support on DSS-34,54 and one 8-hour support on DSS-26. M01O is performing relay operations and requesting seven 8-hour passes on DSS-25,34,54. MRO is mapping and requesting fourteen 8-hour passes on 34H,34B1,34B2. MGSR is in routine operations and requesting one to two 4-hour passes on DSS-26,34,54. SRTF is in routine operations and requesting seven 1-hour passes on 34H,25,34,54. VGR1 is in routine operations and requesting fourteen 8-hour passes on DSS-24,34,54. VGR2 is in routine operations and requesting seven 16-hour passes on DSS-45,34. Negotiation with these projects to secure additional support is required.

STEREO Mission Support



- **Comment:**
  - **As always, the results of this analysis are preliminary in that the network load changes as requirements for planned missions are input and updated. We will continue to work with the STEREO project and other users of the DSN to maximize the time available for each user.**